

What is claimed is:

1 1. A method for performing forward error correction in a SONET system,
2 wherein a coding scheme associated with the forward error correction has a coding factor
3 of (n/k) and an interleaving depth, the method comprising:

4 receiving a data string to be coded, the data string having a number of bytes;

5 dividing the number of bytes by the interleaving depth thereby producing B byte
6 chunks;

7 segmenting each byte chunk based on k of the coding factor thereby producing a
8 number of segments;

9 encoding each segment in accordance with the coding scheme thereby producing
10 consecutive FEC sub-frames, each FEC sub-frame including non-parity
11 bytes and parity bytes;

12 concatenating separately the non-parity bytes and corresponding parity bytes of
13 (B/k) consecutive FEC sub-frames thereby producing rows of a FEC
14 frame having X rows, where X is equal to the interleaving depth; and
15 consecutively interleaving each row of the FEC frame thereby producing a coded
16 data string.

1 2. The method of claim 1 wherein the method is carried out by a FEC
2 coding module implemented by one or more application specific integrated circuits.

1 3. The method of claim 1 wherein the number of bytes included in the data
2 string to be coded make up one row of a SONET STS-N input signal.

1 4. The method of claim 3 wherein the SONET STS-N input signal has a
2 number of rows, and each row is coded independently of the other rows.

1 5. The method of claim 1 wherein the coded data string makes up one row
2 of a SONET-FEC frame.

1 6. The method of claim 1 wherein the number B of byte chunks is an integer
2 number of byte chunks.

1 7. The method of claim 1 wherein the number of segments produced is
2 equal to (B/k) .

1 8. The method of claim 1 wherein the coded data string represents one row
2 of a SONET frame STS-N signal.

1 9. The method of claim 1 further comprising:
2 scrambling the coded data string; and
3 transmitting the scrambled coded data string.

1 10. The method of claim 1 further comprising:
2 in response to there being one or more additional data strings to be coded,
3 repeating the method for each additional data string.

1 11. The method of claim 1 wherein the SONET system defines a number of
2 operatively coupled functional layers including a line layer, a section layer, and a FEC
3 layer, and the method operates in the FEC layer.

1 12. The method of claim 11 wherein the section and line layers are associated
2 with transport overhead bytes, and each transport overhead byte is associated with
3 generation and insert/drop functionality that is executed before the encoding of the FEC
4 layer.

1 13. The method of claim 11 wherein the section layer is associated with an
2 overhead byte B1 that is used for a section error monitoring function, and the line layer

3 is associated with an overhead byte B2 that is used for a line error monitoring function,
4 and both bytes B1 and byte B2 are each calculated using a BIP-8 algorithm before the
5 encoding of the FEC layer.

1 14. The method of claim 11 wherein the SONET system has a transmitting
2 node and a receiving node communicatively coupled by a transmission medium, and at
3 the receiving node, transport overhead bytes B1 and byte B2 are each calculated using a
4 BIP-8 algorithm after a FEC decoding process corresponding to the encoding of the FEC
5 layer has been performed.

1 15. The method of claim 1 wherein the SONET system defines a number of
2 operatively coupled functional layers including a line layer and a combined section &
3 FEC layer, and the method operates in the section & FEC layer.

1 16. The method of claim 15 wherein the section & FEC layer is associated
2 with transport overhead bytes, and each transport overhead byte is associated with
3 generation and insert/drop functionality that is executed after the encoding of the section
4 & FEC layer.

1 17. The method of claim 15 wherein the section & FEC layer is associated
2 with an overhead byte B1 that is used for a section error monitoring function, and byte
3 B1 is calculated using a BIP-8 algorithm after the encoding of the section & FEC layer.

1 18. The method of claim 15 wherein the SONET system has a transmitting
2 node and a receiving node communicatively coupled by a transmission medium, and at
3 the receiving node, transport overhead byte B1 is calculated using a BIP-8 algorithm
4 before a FEC decoding process corresponding to the encoding of the FEC layer has been
5 performed.

1 19. A method for performing forward error correction in one of a SONET
2 system or an SDH system, wherein a coding scheme associated with the forward error
3 correction has a coding factor of (n/k) and an interleaving depth, the method comprising:
4 receiving a data string to be coded, the data string having a number of bytes;
5 dividing the number of bytes by the interleaving depth thereby producing B byte
6 chunks;
7 segmenting each byte chunk based on k of the coding factor thereby producing a
8 number of segments;
9 encoding each segment in accordance with the coding scheme thereby producing
10 consecutive FEC sub-frames, each FEC sub-frame including non-parity
11 bytes and parity bytes;
12 concatenating separately the non-parity bytes and corresponding parity bytes of
13 (B/k) consecutive FEC sub-frames thereby producing rows of a FEC
14 frame having X rows, where X is equal to the interleaving depth; and
15 consecutively interleaving each row of the FEC frame thereby producing a coded
16 data string.

1 20. A method for performing forward error correction in a SONET/SDH
2 system, wherein a coding scheme associated with the forward error correction has a
3 coding factor of (n/k) and an interleaving depth, the method comprising:
4 receiving a coded data string forming a row of a SONET/SDH-FEC frame;
5 estimating bit error using a BIP-8 algorithm thereby characterizing transmission
6 line conditions without the benefit of the forward error correction;
7 de-interleaving the coded data string thereby creating X rows of a FEC frame,
8 where X equals the interleaving depth;
9 decoding each FEC frame in accordance with the coding scheme thereby
10 producing decoded data strings; and

11 interleaving the decoded data strings thereby forming a row of a SONET/SDH
12 frame.

1 21. A method for performing forward error correction in a SONET/SDH
2 system, wherein a coding scheme associated with the forward error correction has a
3 coding factor of (n/k) and an interleaving depth, the method comprising:
4 receiving a coded data string forming a row of a SONET/SDH-FEC frame;
5 de-interleaving the coded data string thereby creating X rows of a FEC frame,
6 where X equals the interleaving depth;
7 decoding each FEC frame in accordance with the coding scheme thereby
8 producing decoded data strings;
9 estimating bit error using a BIP-8 algorithm thereby characterizing transmission
10 line conditions as improved by the forward error correction; and
11 interleaving the decoded data strings thereby forming a row of a SONET/SDH
12 frame.